STATE OF ILLINOIS
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GYPSUM AND ANHYDRITE IN ILLINOIS

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ABSTRACT

Information that could be of value in the possible future economic development of gypsum and anhydrite deposits in Illinois has been collected from well data and assembled in this report. The gypsum and anhydrite occur in the St. Louis limestone formation. They do not crop out and are restricted to the southern half of Illinois. In the deeper parts of the Illinois structural basin anhydrite prevails, but along the shallower marginal area extending roughly from Madison County to Sangamon County both gypsum and anhydrite occur. In general the amount of gypsum present increases with decreasing depth. The minimum depth at which gypsum and anhydrite were found was 470 feet.

The maximum thickness of gypsum, devoid of other materials, encountered in six diamond drill cores from southwestern Illinois, was 2 feet at a depth of 896 feet, but 3 1/2 feet of material averaging 93 percent gypsum was found in another core at 722 feet. Cable tool and rotary drill data are less specific but suggest similar or greater thickness of gypsum.

All available data regarding the presence of gypsum result from drilling for water, coal, or oil, and thus it is possible that drilling specifically directed to the discovery of gypsum might find greater thicknesses of this mineral than have thus far been reported.

INTRODUCTION

Gypsum or anhydrite beds are not known to crop out in Illinois, but both minerals have been encountered in wells in the St. Louis limestone formation in the southern half of Illinois at depths ranging from 470 to 3390 feet. Information on some of these occurrences was given in an Illinois State Geological Survey report (Lamar, 1938), now out of print. Since that report appeared, additional information has accumulated and the present report incorporates both old and new data on the nature and extent of the Illinois deposits and makes the information regarding them available for consideration in the light of present and future economic conditions.

Abandoned coal mine shafts are present in parts of the area where the gypsum and anhydrite occur. There is a possibility that some of these shafts could be rehabilitated to save part of the cost of sinking a shaft to the gypsum or anhydrite beds.

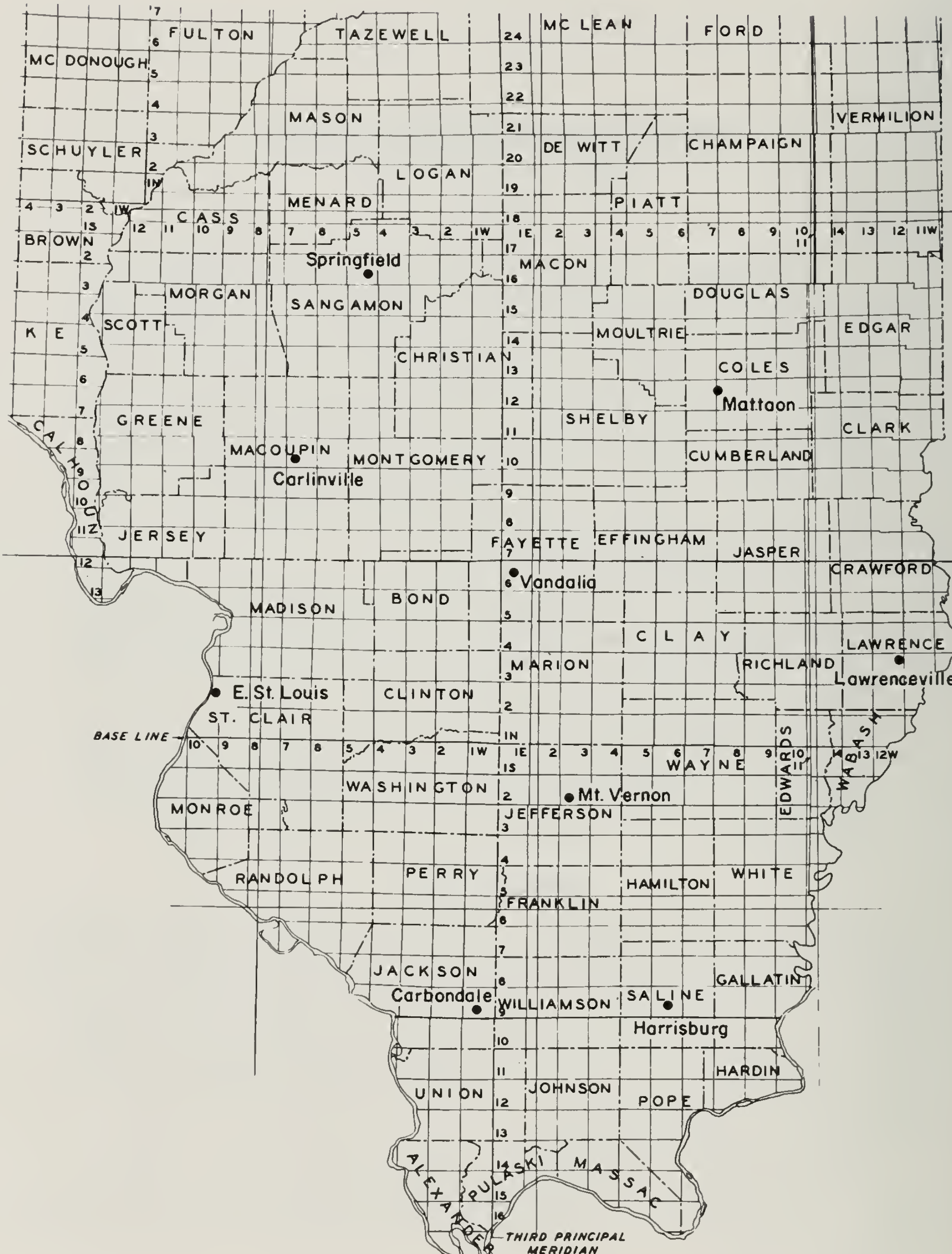

Fig. 1. - Index map of counties.

PROPERTIES OF GYPSUM AND ANHYDRITE

Gypsum is a soft mineral consisting of hydrous calcium sulfate and has the chemical composition $CaSO_4 \cdot 2H_2O$. When suitably heated or "calcined" its composition can be changed to $CaSO_4 \cdot 1/2H_2O$, a product known as plaster of Paris. When mixed with water, plaster of Paris reverts to $CaSO_4 \cdot 2H_2O$ and hardens or "sets." This characteristic is the basis for many of the uses of gypsum.

Anhydrite is harder and heavier than gypsum. It is anhydrous calcium sulfate and has the chemical composition $CaSO_4$. Because it does not contain water it cannot be processed to yield plaster of Paris.

USES OF GYPSUM AND ANHYDRITE

Gypsum has many uses (U. S. Bureau of Mines, 1955). Uncalcined, it is used as, among other things, a portland cement retarder, as agricultural gypsum, as a filler, as rock dust, in brewer's fixe, and in color manufacture.

Calcined, gypsum is used in industry in the manufacture of plate-glass and terra cotta plasters, pottery plasters, orthopedic and dental plasters, statuary, industrial casting and molding plasters, deadburned filler, and for miscellaneous uses.

In the building materials field, gypsum is used for Keene's cement, for various plasters (such as insulating, roof-deck, joint-filler, patching, and painters'). It also is used to make prefabricated lath, wallboard, laminated board, sheathing board, and tile.

Ground anhydrite is used in southern states as a soil conditioner in peanut growing (North, 1956). In Europe anhydrite is employed for making sulfuric acid and cement (Goudge, 1951) and it has been used in ammonium sulfate manufacture (Cole and Rogers, 1933).

PRODUCTION STATISTICS

In 1952 the crude gypsum mined in the United States totalled 8,415,300 short tons and had a value at the mines of $22,896,051, or $2.72 per ton (U. S. Bureau of Mines, 1955). Eight states had three or more active gypsum mines - California, Colorado, Iowa, Michigan, Nevada, New York, Oklahoma, and Texas. No production of anhydrite was reported for 1952.

GENERAL GEOLOGY OF ILLINOIS GYPSUM AND ANHYDRITE

Gypsum and anhydrite beds are found principally in the St. Louis limestone formation of Mississippian age. In some places only one bed is found, in others two or three beds. The existence of three appears to be relatively common but it is not known whether they are stratigraphic equivalents or how the three beds correlate with the occurrences of two beds or a single bed. The term "evaporite zone" is used in this report to describe the strata between the shallowest and deepest occurrences of gypsum and anhydrite. The term "evaporite" is used to refer to gypsum or anhydrite without distinction and relates to the probable direct or indirect role of evaporation in their formation.

The depth at which gypsum and anhydrite beds are encountered is partly, especially locally, a function of the topographic elevation of the ground surface. However, the gradual eastward and southeastward increase in the depth of the beds in the western part of southern Illinois is related to the down-warping of the bedrock strata towards the center of the Illinois basin, a large roughly north-south basin whose deepest part is in White County. East of the center of the basin the strata rise and are locally arched into a fold, called the La-Salle anticline, which is well developed in Clark, Lawrence, and Crawford counties (figs. 1 and 3).

Diamond drill core data and other well data given later suggest that below a depth of about 1500 feet the evaporite material in the evaporite zone of the St. Louis formation consists principally of anhydrite. Where the zone is at progressively shallower depths, the percentage of anhydrite decreases and that of gypsum increases, though the change is not necessarily either uniform or everywhere consistent. Limestone and/or dolomite occur with the evaporites in varying amounts. Probably there is considerable lateral variation within comparatively short distances in the relative proportions of the various components, but these variations are less common in the deeper anhydrite deposits than in the shallower gypsum and anhydrite occurrences.

CHARACTER AND FORMATION OF ILLINOIS GYPSUM AND ANHYDRITE

The gypsum seen in the diamond drill cores and other cuttings generally is colorless, white, or light gray and occurs as relatively coarse tabular crystals. Less common are occurrences of white, chalky gypsum. The anhydrite generally is fine-grained and bluish white to light gray, rarely brown, and under the microscope is seen to have rectangular cleavage. Some coarsely crystalline masses of anhydrite were noted.

It appears probable that the anhydrite originally was deposited from a sea as a result of evaporation. Some of the gypsum may have been similarly deposited and some of it is an alteration product of the anhydrite. Studies of thin sections (D. L. Biggs, personal communication, 1956) from samples at depths of 1034, 1038, 1039, 1052, and 1053 feet, core C-153, described subsequently, lead to the conclusion that the alteration probably was done by groundwater because some crystals of anhydrite have margins altered to gypsum that is in optical continuity with the anhydrite. Other anhydrite crystals are altered to gypsum along their cleavage planes. The gypsum rarely contains isolated carbonate crystals but reveals many included fragments of anhydrite crystals.

That there was probably also some secondary redistribution of anhydrite is apparent because anhydrite occurs as fissure-filling veins in dolomite and as large crystals and irregular masses replacing dolomite. It also replaces the calcite of limestone and occurs as irregular masses in this rock. The anhydrite veins contain fragments of carbonate crystals, and other types of anhydrite occurrences show isolated carbonate crystals that are locally abundant.

CHEMICAL ANALYSES

Chemical analyses were made of two samples of gypsum and three samples of anhydrite to obtain specific information regarding their composition. Results of tests are shown in table 1.

Table 1. - Analyses of Gypsum and Anhydrite
(Analyses by L. D. McVicker in the laboratories of the Illinois State Geological Survey)

	Gypsum			Anhydrite	
	Core C28 Depth 918-923'	Core C28 Depth 896-898'	Core C28 Depth 905-912'	Core C28 Depth 1017-1024'	Core C1807 Depth 1260-1264'
SiO_2 and insoluble	1.46	0.68	0.50	1.14	0.50
Fe_2O_3 and Al_2O_3	0.16	0.18	0.10	0.16	0.04
MgO	1.14	0.28	0.60	1.86	0.18
CaO	33.64	32.76	40.86	40.26	41.06
NaCl	0.34	0.69	0.38	0.15	0.26
CO_2	2.04	0.28	0.37	3.93	1.04
SO_3	45.88	45.88	57.10	52.50	56.34
Free water	0.01	0.01	0.01	0.01	0.01
Combined water	16.04	20.23	0.69	0.46	1.23

TYPES AND SIGNIFICANCE OF WELL DATA

Three types of well data have been used in this investigation - a) diamond drill core data, b) cable tool or rotary drill data based on samples saved during the drilling of wells and subsequently studied by Survey geologists, and c) drillers' records of formations encountered in cable tool or rotary drill borings. Although there is considerable variation in the significance of the data from these three sources, all are meaningful in indicating the probable thickness, distribution, and depth of the evaporite zones, and are so used. The possibility of error, as indicated below, should, however, be borne in mind when the data are used.

Of the three types of data mentioned above, that from diamond drill cores is regarded as the most detailed. The cuttings from cable tool and rotary drill wells afford only rough quantitative data regarding the mineral composition of the strata penetrated and do not give details on the manner in which limestone or dolomite may be interbedded in the strata represented by some samples. Comparison of several drillers' logs and older sample study logs with the cuttings from the same wells indicates that a distinction between gypsum and anhydrite has not always been made and that the term gypsum was commonly used to describe both materials. As a result, some well data of this type indicated considerable thicknesses of gypsum that actually is anhydrite or a combination of gypsum and anhydrite. The detail with which small percentages of limestone or dolomite in the gypsum or anhydrite are reported also is probably variable and some, perhaps many, gypsum zones may in reality also contain limestone, dolomite, or anhydrite partings or beds.

COMPARISON OF VARIOUS TYPES OF WELL DATA

Three Sangamon County wells drilled within a mile of each other by different methods afford an opportunity for comparing the types of data resulting from cable tool, rotary, and diamond drilling (fig. 2). All three show gypsum

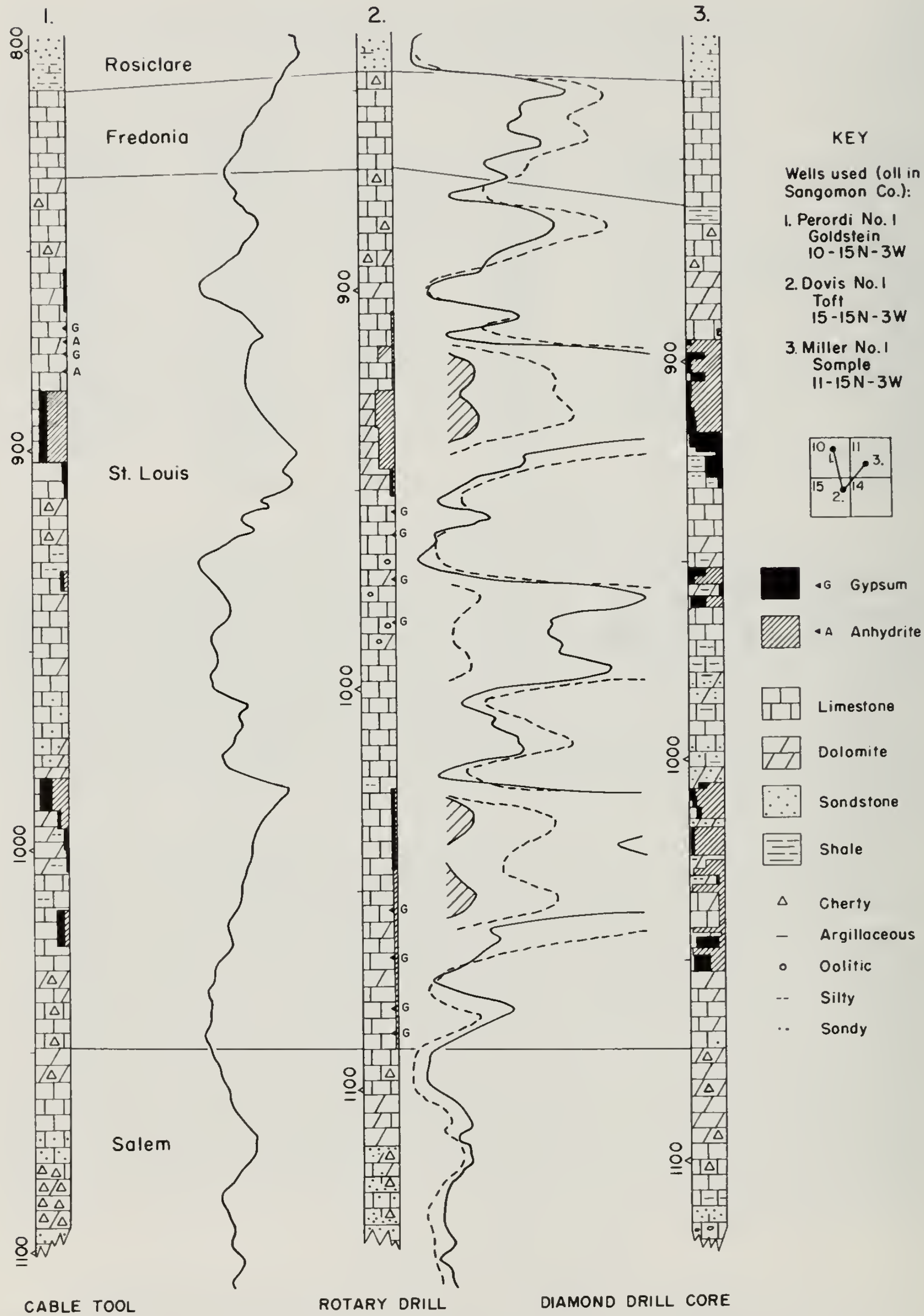

Fig. 2. - Results of studies of a diamond-drill core and of cuttings from a cable-tool well and from a rotary-drill well, all within a mile of each other. A self-potential curve for the rotary well is shown to its left with resistivity curve to its right.

and anhydrite zones at approximately the same depth but there is considerable variation in the amount of detail. It is possible that some of the differences between the logs are real, but it is likely that many of the variations relate to the exactness with which the materials recovered from the wells reflect the character of the evaporite beds penetrated. The diamond drill cores gave the maximum information, followed by the cable tool cuttings and then the rotary drill cuttings.

SIGNIFICANCE OF ELECTRICAL RESISTIVITY DATA

To the left of the rotary drill well record in figure 2 is the self-potential curve for the well. No certain reflection for the evaporite zones is evident. To the right are resistivity curves with electrode spacings of 18 and 54 inches. The marked increase in resistivity, indicated by the deflection of both resistivity curves to the right at the evaporite zones, suggests that resistivity measurements may be helpful in locating such zones where other types of data are lacking.

THE ST. LOUIS FORMATION EVAPORITES

The occurrence of gypsum and anhydrite in the St. Louis formation is treated by a series of maps (figs. 3-6). All the well data used in making these maps are based on core and sample studies. In some areas where there were a great many wells, only selected records were used to avoid crowding the map.

The St. Louis formation is of lower Mississippian age and consists almost entirely of limestone. It crops out in western, southwestern, and extreme southern Illinois but the outcrops contain no evaporites. The formation varies in thickness, as shown in figure 3, and ranges from 0 to more than 450 feet thick. It is absent in the northern half of Illinois. There is no well defined relationship between the thickness of the St. Louis formation and the thickness of the evaporite beds or of the evaporite-bearing zone.

Figure 4 shows the depth to the top of the evaporite zone. In general the depth increases from the northern margin of the zone towards the center of the Illinois structural basin and is greatest in eastern Jasper, eastern Richland, western Clay, and central Wayne counties. The shallowest area occurs in Madison County and parts of adjacent counties where a minimum depth of 470 feet is recorded.

The total thickness of the various evaporite occurrences in the St. Louis formation is shown in figure 5. Maximum thicknesses are shown in a band extending northeast, roughly from East St. Louis. The map indicates further the character of the evaporites as reported in the well logs used in making the map. Except in the case of diamond drill borings, these data are subject to the qualifications previously mentioned regarding the accuracy of the interpretation of rotary and cable tool drill cuttings.

The thickness of the evaporite-bearing zone of the St. Louis formation is indicated in figure 6. The data given are the thicknesses between the shallowest occurrence and the deepest occurrence of the evaporites in the wells plotted on the map. The figures generally do not denote a continuous body of evaporites of the thickness shown although this may be true for some wells. The

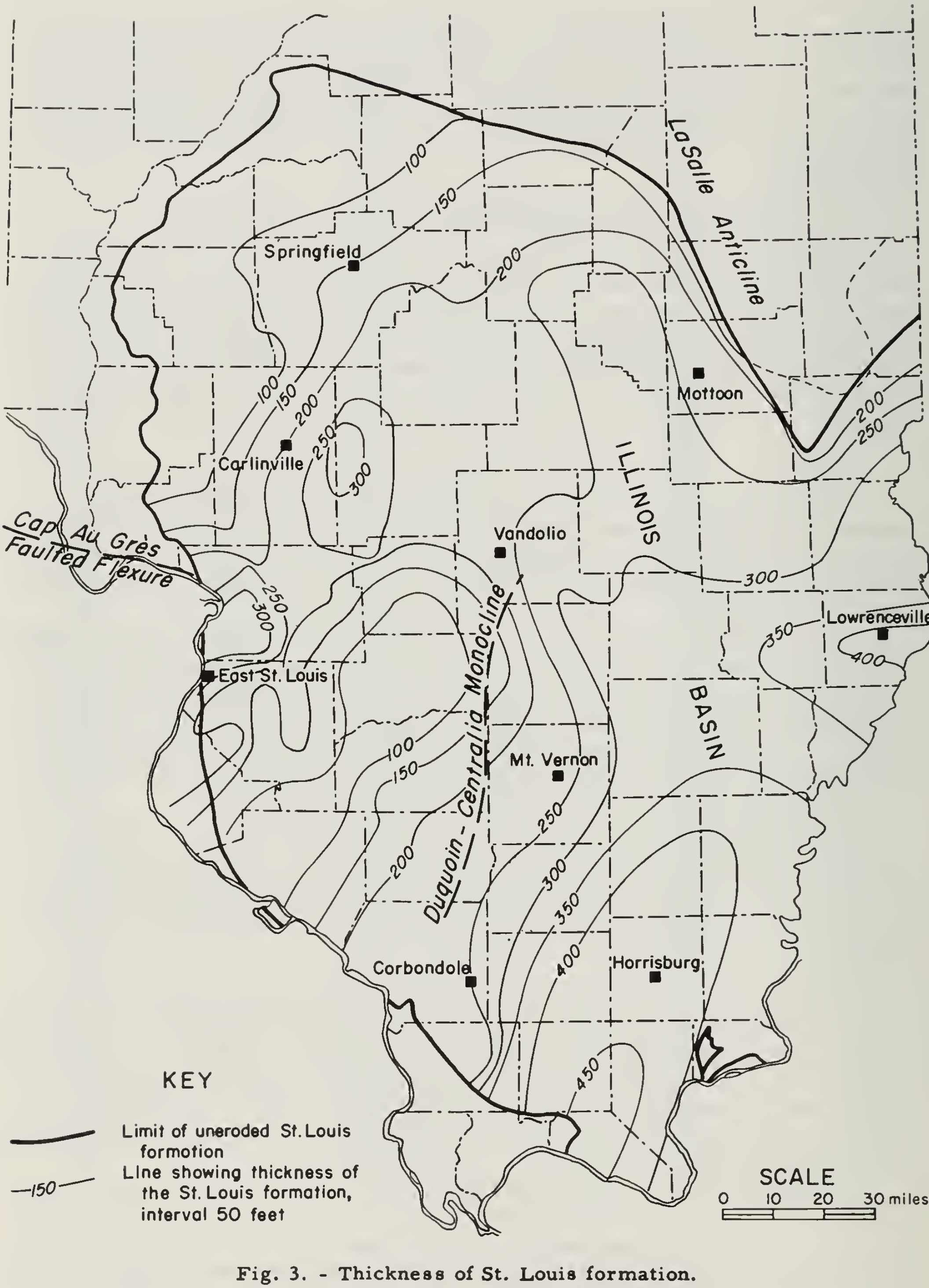

Fig. 3. - Thickness of St. Louis formation.

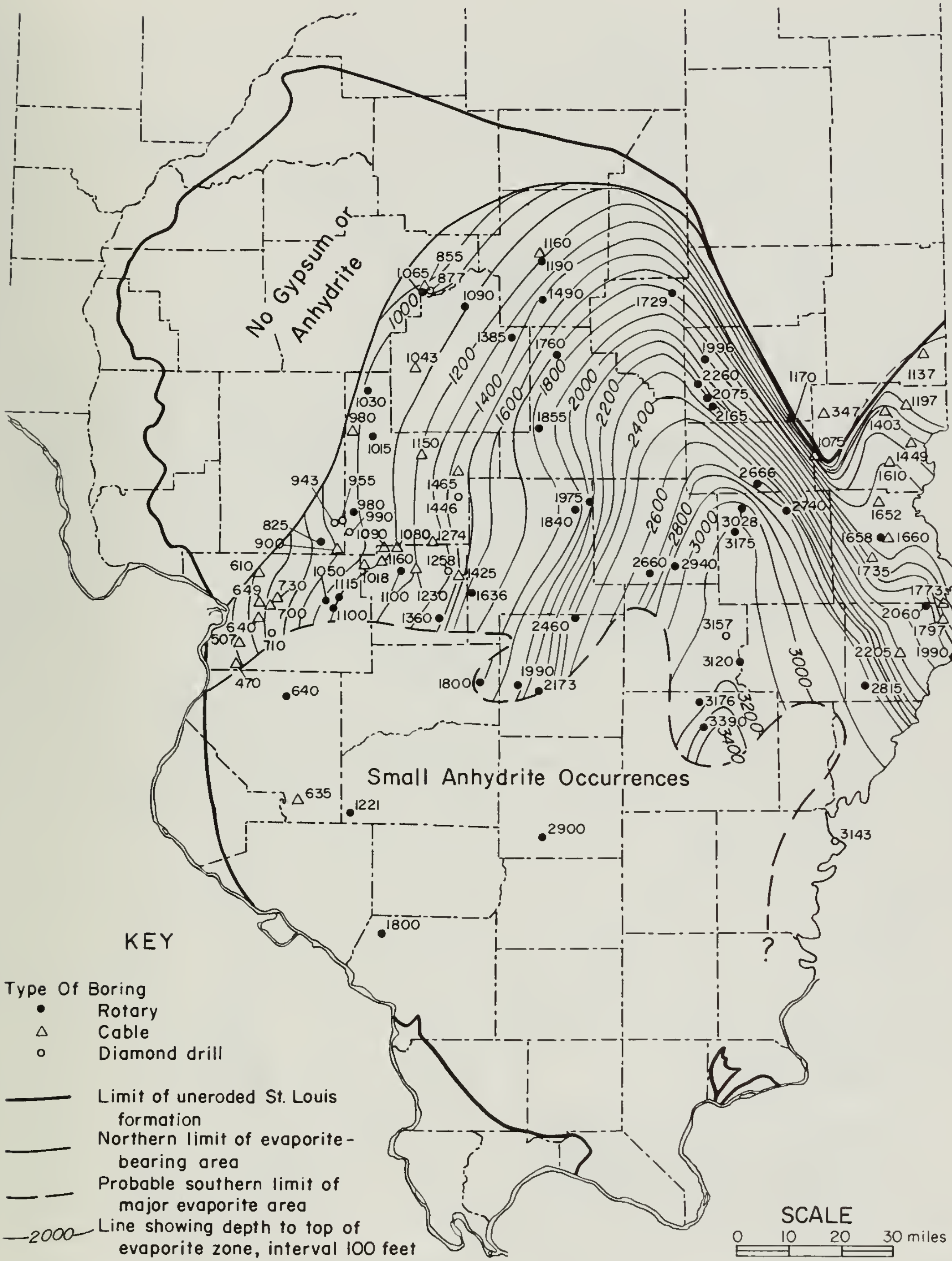

Fig. 4. - Depth to top of St. Louis evaporite zone.

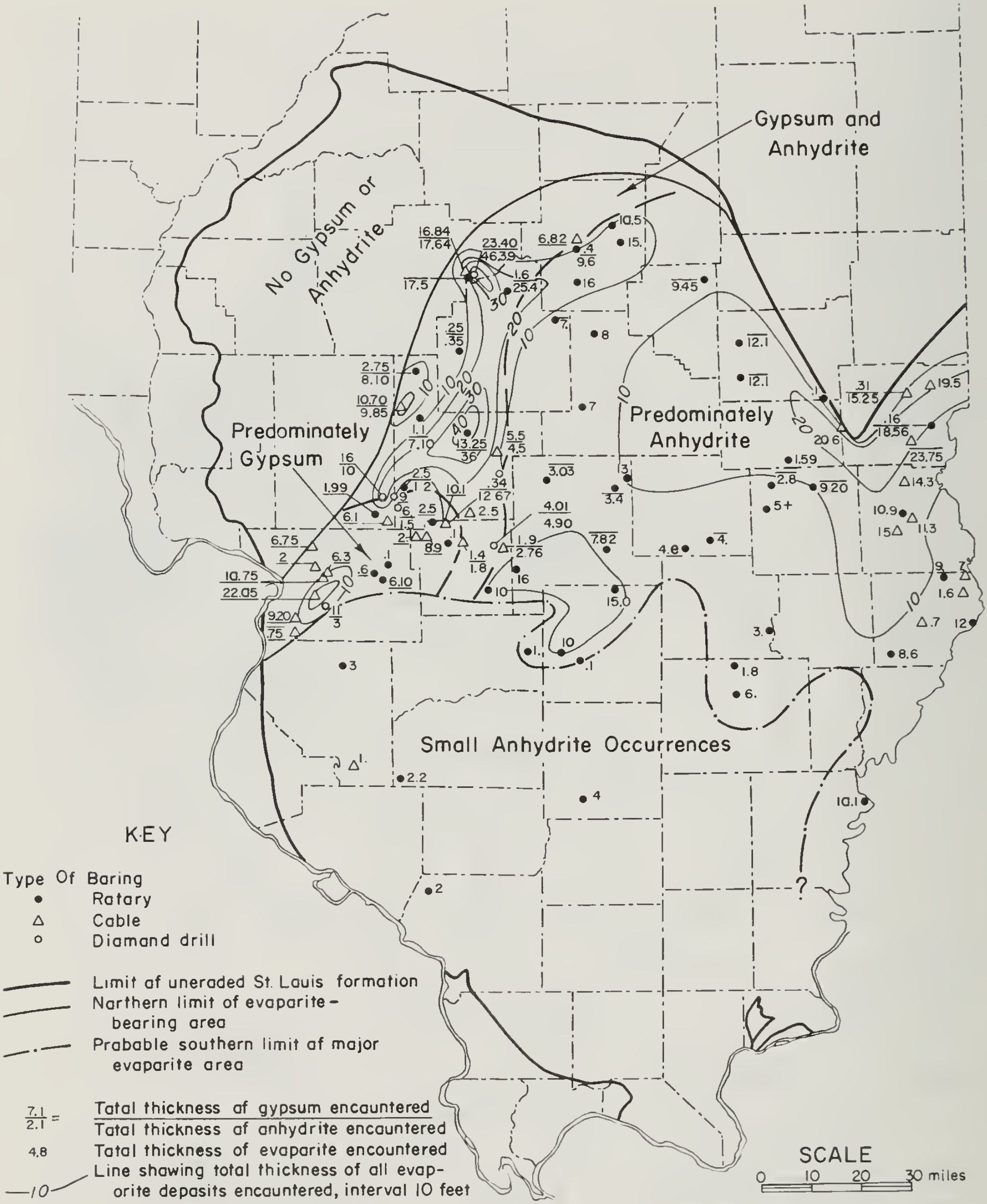

Fig. 5. - Thickness and types of evaporites in the St. Louis formation. For some wells only a figure above a horizontal line is given, others have only a figure below the horizontal line. The absence of a figure above the line indicates the absence of gypsum, the absence of a figure below the line shows the absence of anhydrite.

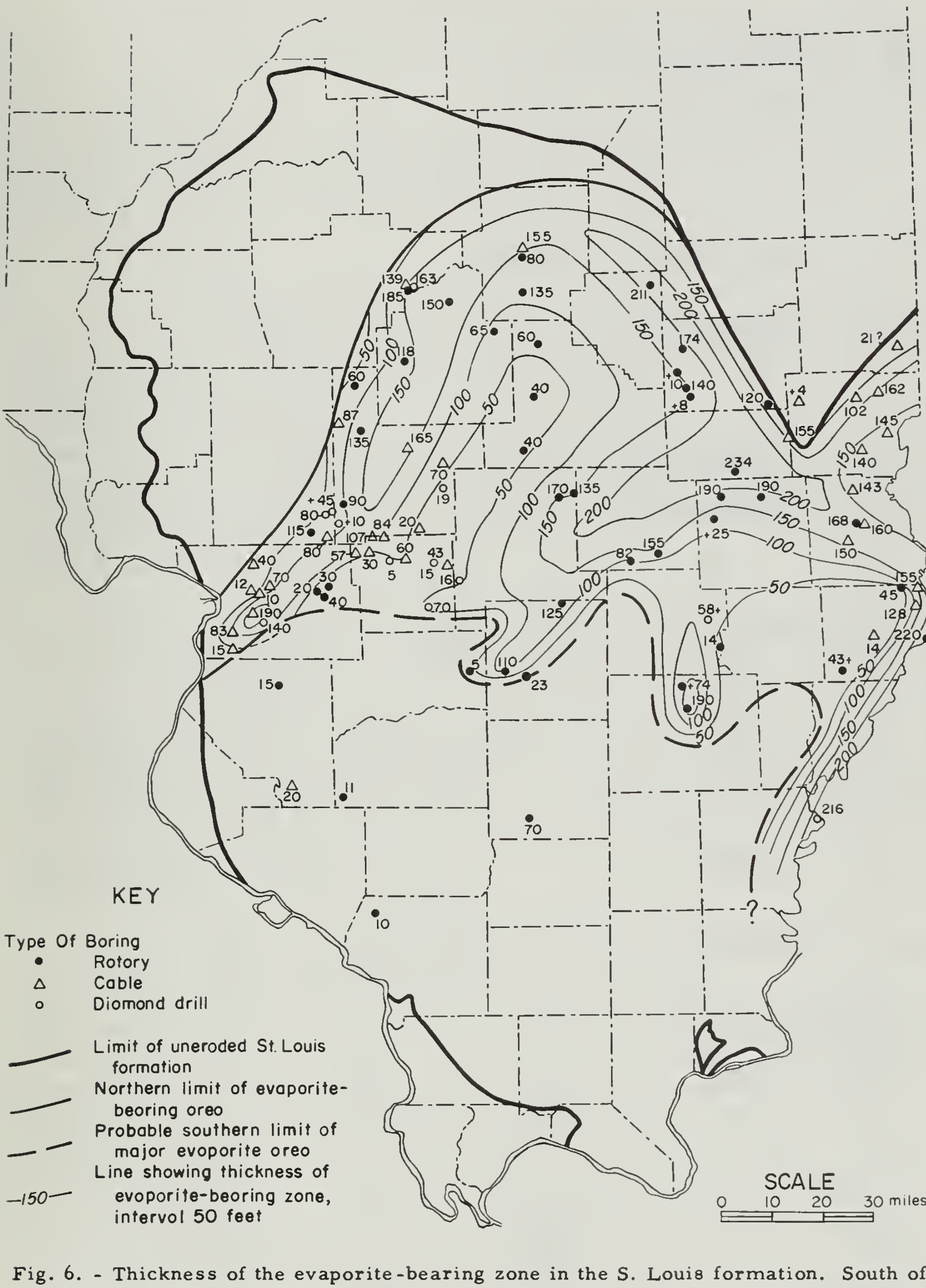

Fig. 6. - Thickness of the evaporite-bearing zone in the S. Louis formation. South of the major evaporite area only minor amounts of evaporites are present locally.

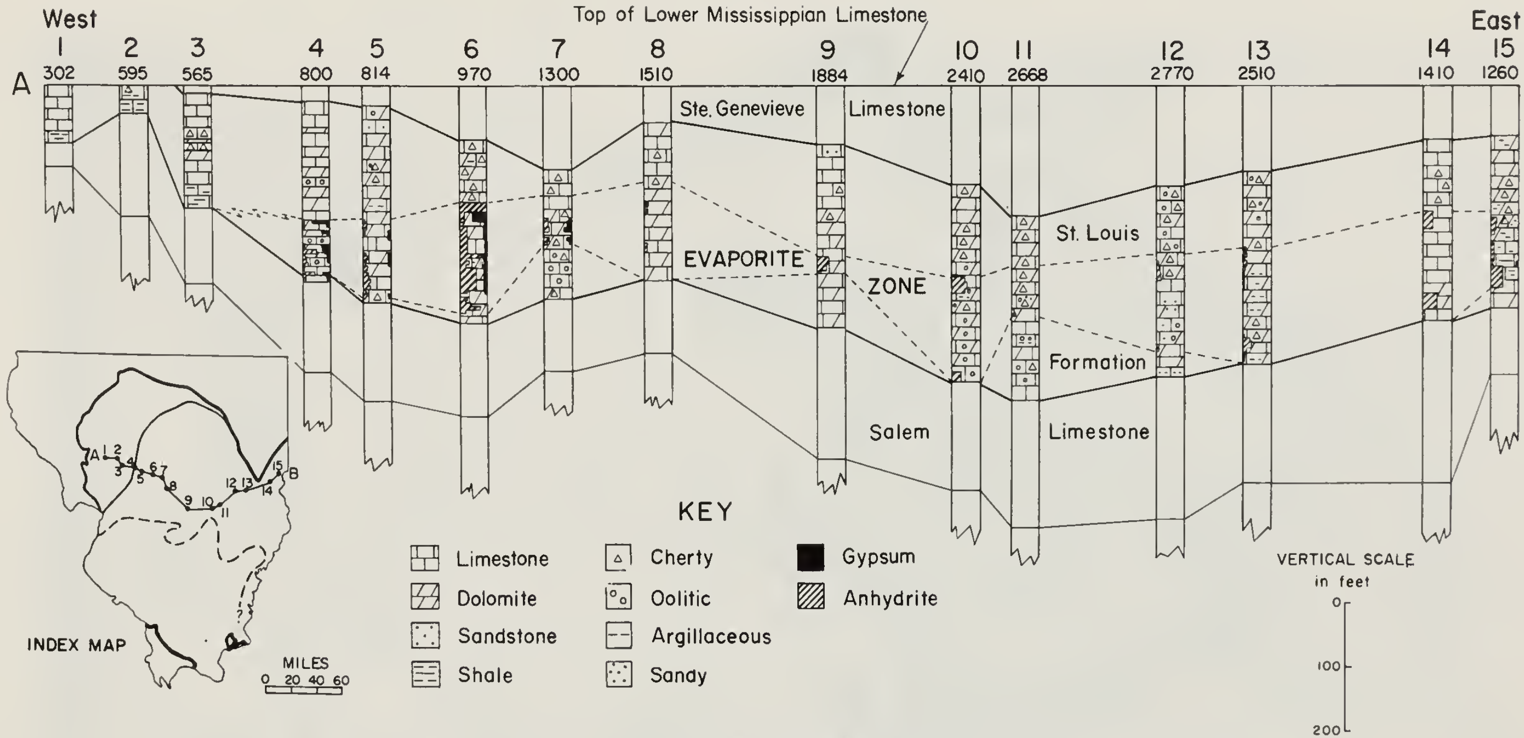

Fig. 7. - Cross section across Illinois basin showing evaporite zone in the St. Louis formation, based on a study of well cuttings.

Wells are "lined up" on the top of the Lower Mississippian limestone, depth to top of which is shown above each well. Note that gypsum is present only above a depth of about 1500 feet. The following wells were used in the study:

1.	R*	J. Castle #1 G. Butcher	17-12N-9W,	Macoupin Co.
2.	C*	Gerhardt #1 Launer	23-12N-8W,	Macoupin
3.	C	Adams & Lagers #1 Bristow	7-11N-7W,	Macoupin
4.	C	Randall & Babler #2 Street	31-11N-5W,	Montgomery
5.	R	Gulf Ref. Co. #1 Brandon	1-10N-5W,	Montgomery
6.	R	J. Brown #1 Lipe	28-10N-3W,	Montgomery
7.	C	D. Frazier #1 E. Battles	10-9N-2W,	Fayette
8.	R	Texas Co. #1 S. Stokes	7-8N-1E,	Fayette
9.	R	Texas Co. #1 Swarm-Christian	30-6N-3E,	Fayette Co.
10.	R	Kingwood Oil Co. #1 Bartels	26-6N-5E,	Effingham
11.	R	Kingwood Oil Co. #1 McWhorter	15-6N-6E,	Effingham
12.	R	H. H. Weinert Inc. #1 Isley	24-8N-8E,	Jasper
13.	R	Hoffman et al. #1 King	20-8N-10E,	Jasper
14.	C	Ark. Fuel Oil Co. #1 Alexander	4-9N-12W,	Clark
15.	C	Yeager et al. #1 Robinson	17-10N-11W,	Clark

* R = Rotary; C = Cable.

maximum thickness of the evaporite zone is 234 feet and occurs in southern Cumberland County. In general the thickest portion of the zone forms an arc opening to the south and bordering the northern boundary of the area of evaporite deposits.

The position of the evaporite zone in the St. Louis formation is shown in figure 7. The zone is restricted to the lower one-half or three-fifths of the St. Louis formation. However, the distribution of specific evaporite occurrences within the lower St. Louis formation is sporadic.

Data on Specific Wells

The areas wherein the evaporite beds are shallowest and contain most gypsum occur, as has been shown, in Bond, Christian, Madison, Macoupin, Montgomery, and Sangamon counties in western and central Illinois. All diamond drill cores in Survey files from these counties have been examined in detail and are reported in part 1 of the appendix. A similar study was made of representative well cuttings in the Survey's possession from the same counties. Part 2 of the appendix gives the records of all wells studied in which at least one sample contained 25 percent or more gypsum. One record having only one sample containing 20 percent gypsum is included because there was no anhydrite associated with the gypsum.

Diamond Drill Core Data

Eight diamond drill cores penetrating gypsum and anhydrite were available for study. Composition of the cores as reported is based on visual estimates, a sufficient number of which were checked by microscopic and x-ray examinations to warrant the belief that they are reasonably correct. The maximum thickness of gypsum encountered, devoid of any other materials, was two feet in core C28 at a depth of 896 feet. However, core C141 had 42 inches of material averaging 93 percent gypsum at a depth of 722 feet to 725 feet 6 inches, core C153 had 26 inches averaging 92 percent gypsum at 1025 feet 1 inch to 1027 feet 2 inches, and core C28 had 60 inches averaging 83 percent gypsum at a depth of 918 to 923 feet.

Cable Tool and Rotary Drill Data

No samples in the cable tool and rotary drill borings studied were 100 percent gypsum. However, the minimum thickness represented by any sample was five feet, so it is possible that beds of gypsum free from anhydrite, limestone, or dolomite and less than five feet thick might be present but would not be distinguished in the cuttings. Contamination of the cuttings from overlying strata may be involved also. Well 6129 in Madison County penetrated a 10-foot thickness of material consisting of 85 percent gypsum and 15 percent cherty limestone at a depth of 700 to 710 feet. Well 19,477 in Sangamon County encountered at 890 to 903 feet a 13-foot thickness of rock composed of 65 percent gypsum and 35 percent anhydrite, limestone, and dolomite. In Montgomery County well 5232 went through a 15-foot thickness consisting of 55 percent gypsum, 10 percent anhydrite, and 35 percent dolomite at a depth of from 1165 to 1180 feet. In the same county, well 4832 found 5 feet of material that was 60 percent gypsum, 5 percent anhydrite and 35 percent limestone at 980 to 985 feet.

Bond County well 3843 found at 1080 to 1090 feet a 10-foot thickness of gypsum and limestone in equal amounts.

Additional Data

The Survey has in its files cuttings from many wells that have not been studied because of the magnitude of the work involved. This is especially true of cuttings from wells in a number of oil fields within the area considered in this report. These well cuttings are available for examination in the Survey laboratories.

EVAPORITES IN OTHER FORMATIONS

Other major occurrences of anhydrite in formations other than the St. Louis limestone are to be found in the Ordovician dolomites and limestones, ranging from a minimum depth of 1768 feet in Randolph County to a maximum of 7683 feet in White County. In Fayette, Randolph, Perry, Jackson, and Lawrence counties, anhydrite is found mainly in the Joachim-Dutchtown dolomite. In White County near Grayville a study of the Superior-Ford C-17 diamond drill core showed anhydrite in the Dutchtown and Knox dolomites as follows.

Thickness (feet)	Depth (feet)	Composition (%) Anhydrite	Dolomite
	Dutchtown formation		
86	7114-7200	50	50
21	7200-7221	15	85
33	7221-7254	2-4	96-98
	Glenwood shale		
	St. Peter sandstone		
	Knox dolomite		
173	7510-7683	3-5	95-97

The anhydrite is for the most part very finely crystalline, although some of it is coarsely crystalline. It is dark bluish to brownish gray.

ECONOMIC POSSIBILITIES

The data in this report do not demonstrate the existence of commercial deposits of gypsum in Illinois but they are worthy of consideration if for no other reason than because of the proximity of the gypsum occurrences to a major market area, that of greater St. Louis, which is being supplied from more distant sources.

It is noteworthy that none of the wells whose records have been used in the preparation of this report were drilled for the purpose of finding gypsum. Considerable areas that may contain gypsum have not been explored. Thus it is possible that borings located at suitably selected places might find gypsum at shallower depths and in greater thicknesses than are reported herein. It is significant also that the greatest thicknesses of gypsum noted occur at comparatively shallow depths where the possibilities for the hydration of anhydrite to gypsum appear to be better than they are at greater depths. These two considerations suggest that the near outcrop areas northeast of East St. Louis bear further scrutiny.

It has been pointed out that no evaporites crop out in Illinois despite the fact that the St. Louis formation is extensively exposed in western, southwestern, and extreme southern Illinois. Evidence that the outcropping beds may have contained evaporites at some time is suggested by the presence of beds of limestone conglomerate or breccia in western and southwestern Illinois at about the same stratigraphic horizons as the unexposed evaporite zone. These conglomerates or breccias may have resulted from the removal of evaporites by solution from deposits of interbedded limestone and evaporites. If this is true, it indicates that the distribution of evaporites in western and southwestern Illinois was at one time more widespread than at present and further points to the area as one that may merit specialized investigation for evaporites.

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APPENDIX

PART 1

Descriptions of diamond drill cores in Bond, Macoupin, Madison, Montgomery and Sangamon Counties. One core from White County is described to show the nature of the evaporites in the deeper parts of the Illinois basin.

CORE C1807

Schwartz and Shell, Studebaker No. 1

SE¼ SE¼ SW¼ sec. 21, T. 6 N., R. 2 W., Bond Co.

Thickness (ft.)	Bottom depth (ft.)	Estimated composition (%)			
		Gypsum	Anhydrite	Limestone	Dolomite
1	1259	3	0	97	0
1	1260	97	0	3	0
4	1264	8	90	2	0
1½	1265½	5	15	80	0
2½	1268	55	35	0	10
1	1269	85	0	0	15

CORE 153

Madison Coal Co., Boring 15

SW cor. NW¼ NE¼ sec. 35, T. 8 N., R. 6 W., Macoupin Co.

Sample	Thickness (in.)	Bottom depth (ft.)	Estimated composition (%)		
			Gypsum	Anhydrite	Limestone
S 35	7	942'11"	0	0	100*
No core	1	943' 0"			
37	7	943' 7"	100	0	0
38	17	945' 0"	90	0	10†
No core	4	945' 4"			
42	10	946' 2"	0	0	100*
43A	32	948'10"	80	0	20†
43B	2	949' 0"	5	0	95†
43C	24	951' 0"	95	0	5†
43D	9	951' 9"	90	0	10
44	5	952' 2"	5	0	95
S 57A	17	975'11"	0	0	100†
56A	9	976' 8"	8	2	85†
58A	6	977' 2"	Trace	0	100†
58B	9	977'11"	10	0	80°

CORE 153 (continued)

Sample	Thickness (in.)	Bottom depth (ft.)	Estimated composition (%) Gypsum	Anhydrite	Limestone
59	10	978' 9"	60	20	20†
60-61	13	979'10"	30	0	70†
61½	5	980' 3"	100	0	0
62	2	980' 5"	10	0	90†
63	12	981' 5"	50	25	25°
64A	10	982' 3"	12	85	3
64B	18	983' 9"	98	2	0
65	19	985' 4"	30	0	70†
S 76A	21	1012' 9"	10	90	0
76B	6	1013' 3"	20	60	20
76C	26	1015' 5"	9	90	1
76D	11	1016' 4"	40	35	25*
S 80A	24	1021' 5"	12	85	3*
80B	4	1021' 9"	100	0	0
80C	5	1022' 2"	3	10	87
80D	18	1023' 8"	10	85	5*
80E	17	1025' 1"	7	90	3
80F	6	1025' 7"	100	0	0
80G	3	1025'10"	50	0	50*
80H	17	1027' 3"	98	0	2
80I	3	1027' 6"	40	0	60
Average Composition of High Gypsum Zones					
37-43D	101	943'0"-951'9"*	78	0	22
61½-64B	47	979'10"-983'9"	63	26	11
80F-H	26	1025'1"-1027'3"	92	0	8

* = Argillaceous; † = Dolomite; ° Includes 4" from which no core was recorded.

CORE C154
Madison Coal Co., Boring 16
SE¼ SE¼ SE¼ sec. 36, T. 8 N., R. 6 W., Macoupin Co.

Sample	Thickness (in.)	Bottom depth (ft.)	Estimated composition (%) Gypsum	Anhydrite	Limestone
33	5	955' 5"	20	0	80
34	10	956' 3"	0	0	100*
35A	20	957'11"	80	10	10*
35B	3	958' 2"	40	60	Trace
35C	8	958'10"	95	5	Trace
35D	5	959' 3"	60	10	30*
35E	8½	959'11½"	85	3	12*
35F	4	960' 3½"	88	10	2

CORE C154 (continued)

Sample	Thickness (in.)	Bottom depth (ft.)	Estimated composition (%) Gypsum	Anhydrite	Limestone
35G	7	960'10½"	55	5	40*
36	7	961' 5½"	0	0	100†
		Average Composition of High Gypsum Zone			
35A-35F	48½	956'3"-960'3½"	79½	11	9½

* = Argillaceous; † = Dolomite.

CORE C141

Madison Coal Co., Boring 6

SE cor. SW¼ SW¼ sec. 26, T. 4 N., R. 8 W., Madison Co.

Sample	Thickness (in.)	Bottom depth (ft.)	Estimated composition (%) Gypsum	Anhydrite	Limestone
26	9	710' 9"	0	0	100*
27A	19	712' 4"	100	Trace	0
27B	14	713' 6"	70	30	Trace
27C	6	714' 0"	25	73	2
27D	3	714' 3"	10	5	85
27E	8	714'11"	10	85	5
27F	22	716' 9"	60	10	30*
27G	14	717'11"	15	10	75*
27H	7	718' 6"	10	90	0
27I	8	719' 2"	5	50	45
28A	34	722' 0"	55	5	40*
28B	7	722' 7"	85	10	5
28C	9	723' 4"	95	2	3
28D	1	723' 5"	10	0	90*
28E	6	723'11"	100	0	0
28F	5	724' 4"	90	Trace	10
28G	14	725' 6"	100	0	0
29	4	725'10"	40	0	60
30	30	728' 4"	20	0	80
31	23	730' 3"	2	0	98

* = Argillaceous.

Average Composition of High Gypsum Zones

27A-27F	72	710'9"-716'9"	62	25	13
28A	34	719'2"-722'0"	55	5	40
28B-28G	42	722'0"-725'6"	93	2	5

CORE C155

Madison Coal Co., Boring 17

NW¼ NW¼ NW¼ sec. 7, T. 7 N., R. 5 W., Montgomery Co.

Sample	Thickness (in.)	Bottom depth (ft.)	Estimated composition (%)		
			Gypsum	Anhydrite	Limestone
44A	16	991' 8"	10	0	90*
44B	8	992' 4"	0	0	100*
45A	8	993' 0"	60	0	40*
45B	13	994' 1"	95	5	Trace
45C	14	995' 3"	60	35	5
45D	4	995' 7"	15	Trace	85
45E	7	996' 2"	90	Trace	10
45F	4	996' 6"	5	0	95
45G	7	997' 1"	20	5	75
45H	12	998' 1"	60	35	5
45I	4	998' 5"	60	15	25*
45J	12	999' 5"	45	50	5
45K	2	999' 7"	10	0	90*
45L	4½	999'11½"	60	25	15
Average Composition of High Gypsum Zones					
45A-45C	35	992'4"-995'3"	73	16	11
45H-45L	34½	997'1"-999'11½"	52	35	13

* = Argillaceous.

CORE C2663

Superior Oil Co., Singer No. 1

SE¼ SE¼ NW¼ sec. 3, T. 8 N., R. 2 W., Montgomery Co.

Thickness (ft.)	Bottom depth (ft.)	Estimated composition (%)			
		Gypsum	Anhydrite	Dolomite	Limestone
2	1446	0	0	100	0
3	1449	2	98	0	0
4	1453	10	0	0	90
3	1456	5	95	0	0
4	1460	2	98	0	0
1	1461	2	0	98	0
1	1462	0	35	65	0
3	1465	3	85	12	0
9	1474	0	0	10	0

CORE C28

Millar Co., Sample Farm

Cen. sec. 11, T. 15 N., R. 3 W., Sangamon Co.

Thickness (ft.)	Bottom depth (ft.)	Estimated composition (%) Gypsum	Anhydrite	Dolomite	Other
2	892	0	0	0	Ls.-100
2	894	0	10	-	Ls. & dol.-90
1	895	97	3	0	0
1	896	5	95	0	0
2	898	100	Trace	0	0
1	899	50	50	0	0
4	903	10	90	0	0
2	905	40	50	10	0
4	909	10	90	0	0
3	912	15	85	0	0
3	915	15	85	0	0
3	918	20	80	0	0
4	922	85	10	0	Ls. & sh. 5
1	923	75	5	20	0
1	924	10	5	85	0
5	929	50	0	50*	0
3	932	10	0	90*	0
20	952	0	0	100	0
2	954	45	50	5	0
2	956	10	85	5	0
3	959	5	0	95	0
3	962	40	50	10	0
44	1006	0	0	0	Dol. & ls.-100
1	1007	25	50	-	Dol. & sh.-25
3	1010	10	90	0	0
2	1012	15	80	5	0
3	1015	15	70	15	0
2	1017	0	0	100	0
7	1024	5	90	5	0
1	1025	0	0	100	0
2	1027	0	50	50	0
2	1029	10	90	0	0
2	1031	5	15	-	Dol. & sh.-80
2	1033	5	95	0	0
9	1042	0	15	-	Dol. & ls.-85
1	1043	0	95	5	0
1	1044	0	5	95	0
3	1047	Trace	85	15	0
2	1049	5	95	0	0
4	1053	50	40	10	0
2	1055	2	0	98	0
	Average Composition of High Gypsum Zones				
4	894-898	$75\frac{1}{2}$	$24\frac{1}{2}$	0	0
5	918-923	83	9	4	4

* = Silty and argillaceous; Ls. = Limestone; Dol. = Dolomite; Sh. = Shale.

CORE 2740

Superior Oil Co., H. C. Ford Farm, No. C17
$SW\frac{1}{4}$ $SE\frac{1}{4}$ sec. 27, T. 4 S., R. 14 W., White Co.

Thickness (ft.)	Bottom depth (ft.)	Estimated composition (%)		
		Gypsum	Anhydrite	Dolomite
1	3144	0	Trace	100 - silty
5	3149	0	100	0
1	3150	0	50	50 - silty
9	3159	0	0	100
2	3161	0	50	50 - silty
3	3164	0	100	0
1	3165	0	0	100

PART 2

Studies of samples from cable tool and rotary wells in Bond, Clark, Macoupin, Madison, Montgomery, and Sangamon counties. Only those wells are reported in which at least one of the samples contained 25 percent or more gypsum. One well with only one sample containing 20 percent gypsum is included because there was no anhydrite associated with the gypsum.

Trace = less than 1/2%.
Little = more than 1/2% but less than 1%.

WELL 3522

$NW\frac{1}{4}$ $NW\frac{1}{4}$ sec. 16, T. 6 N., R. 3 W., Bond Co.

Thickness represented by samples (ft.)	Bottom depth (ft.)	Estimated composition (%)			
		Gypsum	Anhydrite	Limestone	Dolomite
5	1230	2	-	98	-
5	1235	25	35	40	-
5	1240	Little	Little	100	-
45	1285	Trace	Trace	100	-
10	1295	Little	Trace	100	-

WELL 7126

$NW\frac{1}{4}$ $NW\frac{1}{4}$ $SE\frac{1}{4}$ sec. 8, T. 6 N., R. 4 W., Bond Co.

Thickness represented by samples (ft.)	Bottom depth (ft.)	Estimated composition (%)			
		Gypsum	Anhydrite	Limestone	Dolomite
5	1145	3	-	97	-
5	1150	5	-	95	-
5	1155	15	-	85	-

WELL 7126 (continued)

Thickness represented by samples (ft.)	Bottom depth (ft.)	Estimated composition (%)			
		Gypsum	Anhydrite	Limestone	Dolomite
5	1160	30	-	70	-
10	1170	5	-	95	-
5	1175	8	-	92	-
5	1180	5	-		95
10	1190	45	-		55
5	1195	12	-	88	-

WELL 3843

NW¼ SW¼ SE¼ sec. 27, T. 7 N., R. 4 W., Bond Co.

Thickness represented by samples (ft.)	Bottom depth (ft.)	Estimated composition (%)			
		Gypsum	Anhydrite	Limestone	Dolomite
10	1090	50	-	50	-
5	1095	17	-	83	-
6	1101	20	-	80	-
9	1110	8	-	92	-
5	1115	4	-	96	-
15	1130	2	-	98	-
5	1135	5	-	95	-
5	1140	10	-	90	-
7	1147	15	-	85	-

WELL 7783

NW¼ SW¼ NE¼ sec. 31, T. 7 N., R. 4 W., Bond Co.

Thickness represented by samples (ft.)	Bottom depth (ft.)	Estimated composition (%)			
		Gypsum	Anhydrite	Limestone	Dolomite
30	1030	Little	-	100	-
10	1040	25	-	75	-
10	1050	Little	-	100	-

WELL 19,249

SW¼ SE¼ NW¼ sec. 26, T. 7 N., R. 6 W., Macoupin Co.

Thickness represented by samples (ft.)	Bottom depth (ft.)	Estimated composition (%)			
		Gypsum	Anhydrite	Limestone	Dolomite
30	930	2	-	98	-
10	940	10	-	90	-

WELL 19,249 (continued)

Thickness represented by samples (ft.)	Bottom depth (ft.)	Estimated composition (%)			
		Gypsum	Anhydrite	Limestone	Dolomite
10	950	15	-	85*	-
10	960	Little	-	-	100*
10	970	20	-	80	-
10	980	10	-	90	-
20	1000	Little	-	100	-

* Includes shale.

WELL 3480

SW¼ SE¼ SE¼ sec. 2, T. 3 N., R. 9 W., Madison Co.

Thickness represented by samples (ft.)	Bottom depth (ft.)	Estimated composition (%)			
		Gypsum	Anhydrite	Limestone	Dolomite
8	515	Little	-	100	-
10	525	3	-	97	-
25	550	-	-	100	-
10	560	35	Little	65	-
5	565	10	-	-	90
5	570	20	-	80	-
15	585	25	-	75	-
5	590	3	-	97	-

WELL 3162

SE¼ SW¼ NE¼ sec. 9, T. 4 N., R. 8 W., Madison Co.

Thickness represented by samples (ft.)	Bottom depth (ft.)	Estimated composition (%)			
		Gypsum	Anhydrite	Limestone	Dolomite
10	650	5	-	95	-
10	660	25	-	75	-
10	670	3	-	97	-
35	705	Little	-	100	-
10	715	25	-	75	-
25	740	5	-	95	-
20	760	Little	-	100	-
15	775	50	Little	50	-
10	785	40	Little	60	-
10	795	5	Little	95	-
10	805	15	Little	85	-
15	820	10	Little	90	-

WELL 1312

SW¼ SW¼ NE¼ sec. 24, T. 5 N., R. 8 W., Madison Co.

Thickness represented by samples (ft.)	Bottom depth (ft.)	Estimated composition (%)			
		Gypsum	Anhydrite	Limestone	Dolomite
10	740	20	-	80	-
10	750	3	-	97	-
7	757	5	-	95	-
11	768	30	-	70	-
7	775	5	-	95	-
20	795	Little	-	100	-

WELL 6129

SE¼ SW¼ NE¼ sec. 27, T. 5 N., R. 8 W., Madison Co.

Thickness represented by samples (ft.)	Bottom depth (ft.)	Estimated composition (%)			
		Gypsum	Anhydrite	Limestone	Dolomite
5	695	10	-	90	-
5	700	20	-	80	-
10	710	85	-	15*	-
5	715	15	-	-	85

* = Cherty.

WELL 18,946

SE¼ SE¼ SW¼ sec. 29, T. 6 N., R. 8 W., Madison Co.

Thickness represented by samples (ft.)	Bottom depth (ft.)	Estimated composition (%)			
		Gypsum	Anhydrite	Limestone	Dolomite
15	625	5	-	-	95
10	635	Trace	-	-	100
15	650	40	-	-	60*

* Includes shale.

WELL 5311

NW¼ SE¼ NW¼ sec. 10, T. 9 N., R. 2 W., Montgomery Co.

Thickness represented by samples (ft.)	Bottom depth (ft.)	Estimated composition (%)			
		Gypsum	Anhydrite	Limestone	Dolomite
5	1505	10	15	75	
10	1515	20	10	70	-
5	1520	30	10	60	-
10	1530	-	-	-	100
5	1535	20	10	-	70
5	1540	10	5	85	-

WELL 5232

SW¼ SW¼ SE¼ sec. 28, T. 10 N., R. 3 W., Montgomery Co.

Thickness represented by samples (ft.)	Bottom depth (ft.)	Estimated composition (%)			
		Gypsum	Anhydrite	Limestone	Dolomite
15	1165	-	100	-	-
15	1180	55	10	-	35
10	1230	10	20		70
5	1235	15	70		15
5	1240	10	20	-	70
5	1245	10	30	-	60
5	1250	20	15	-	65
5	1285	15	55	-	30
5	1290	10	20	-	70
5	1295	-	-	-	100
5	1300	-	20	80	-
5	1305	-	10	90	-
5	1310	-	30	70	-
5	1315	-	70	30	-
5	1320	-	10	90	-

WELL 4832

NW¼ NE¼ SE¼ sec. 31, T. 11 N., R. 5 W., Montgomery Co.

Thickness represented by samples (ft.)	Bottom depth (ft.)	Estimated composition (%)			
		Gypsum	Anhydrite	Limestone	Dolomite
5	980	-	-	100	-
5	985	60	5	35	-
5	990	10	3	87	-
5	995	0	0	100	-
5	1000	30	Little	70	-
5	1005	3	0	97	-
10	1015	Trace	0	100	-
10	1025	25	4	71	-
5	1030	20	50	30	-
5	1035	8	4	88	-
10	1045	2	7	91	-
5	1050	Little	10	90	-
10	1060	Little	2	98	-
5	1065	25	35	40	-
10	1075	2	5	93	-

WELL 19,477

SW¼ NW¼ NE¼ sec. 10, T. 15 N., R. 3 W., Sangamon Co.

Thickness represented by samples (ft.)	Bottom depth (ft.)	Estimated composition (%)		
		Gypsum	Anhydrite	Limestone Dolomite
11	866	5	-	95
19	885	1	1	98
5	890	20	70	10
6	896	60	35	5
7	903	70	20	10
5	908	15	-	85
4	912	10	-	90
18	930	-	-	100
5	935	5	15	80
47	982	-	-	100
8	990	35	60	5
5	995	5	35	60
5	1000	5	10	85
5	1005	2	8	90
10	1015	-	-	100
9	1024	20	25	55

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